Radiation Report on **MAX724ECK (LDC 0342)**
Project: GLAST

A radiation evaluation was performed on **MAX724ECK 2A step-down, PWM, switch-mode, DC/DC regulator (Maxim)** to determine the total dose tolerance of these parts. The total dose testing was performed using a Co^{60} gamma ray source. During the radiation testing, eight parts were irradiated under bias and two parts were used as control samples. The total dose radiation levels were 5, 10, 15, and 20kRads(Si). The average dose rate was 0.833krads(Si)/hour (0.23rads(Si)/s). After the 20krad(Si) irradiation, the parts were annealed under bias at 25°C for 168 hours. After each radiation exposure and annealing treatment, parts were electrically tested according to the test conditions and the specification limits listed in Table III. An executive summary of the test results is provided below in bold, followed by a detailed summary of the test results after each radiation level and annealing step.

All parts passed all tests up to 20krads(Si). After annealing the parts at 25°C for 168 hours, no significant change was noted in any parameter.

Initial electrical measurements were made on 10 samples. Eight samples (SN's 598, 599, 600, 601, 602, 603, 604, and 605) were used as radiation samples while SNs 596 and 597 were used as control samples. All parts passed all tests during initial electrical measurements. All devices had the following external markings on the top: MAXIM MAX724ECK 0342PS. There were no markings on the back.

All parts passed all tests up to 20.0krads(Si).

After annealing the parts for 168 hours at 25°C, no significant change was noted in any parameter.

Table IV provides a summary of the test results with the mean and standard deviation values for each parameter after each irradiation exposure and annealing step.

TABLE I. Part Information

Generic Part Number:	MAX724
GLAST Part Number	MAX724ECK
GLAST TID Requirement	20krads(Si)
Manufacturer:	Maxim
Lot Date Code (LDC):	0342
Quantity Tested:	10
Serial Numbers of Control Samples:	596, 597
Serial Numbers of Radiation Samples:	598, 599, 600, 601, 602, 603, 604, 605
Part Function:	DC/DC Regulator
Part Technology:	Hybrid
Package Style:	TO-220
Test Equipment:	Custom setup
Test Engineer:	C. Palor/H. Ngin

- The manufacturer for this part guaranteed no radiation tolerance/hardness.

TABLE II. Radiation Schedule for MAX724

EVENT	DATE
1) INITIAL ELECTRICAL MEASUREMENTS	11/16/04
2) 5 KRAD IRRADIATION (6.45 KRADS (Si)/HOUR)	11/16/04
POST-5 KRAD ELECTRICAL MEASUREMENT	11/16/04
3) 10 KRAD IRRADIATION (6.45 KRADS (Si)/HOUR)	11/16/04
POST-10 KRAD ELECTRICAL MEASUREMENT	11/16/04
4) 15 KRAD IRRADIATION (6.45 KRADS (Si)/HOUR)	11/16/04
POST-15 KRAD ELECTRICAL MEASUREMENT	11/16/04
5) 20 KRAD IRRADIATION (0.3 KRADS (Si)/HOUR)	11/16/04
POST-20 KRAD ELECTRICAL MEASUREMENT	11/17/04
6) 168 HOUR ANNEALING @25°C	11/17/04
POST-168 HOUR ANNEAL ELECTRICAL MEASUREMENT	11/24/04

Average Dose Rate = 20,000RADS(Si)/24 HOURS=833RADS(Si)/HOUR=0.23RADS(Si)/SEC

Table III. Electrical Characteristics MAX724

Test #	Parameter	Units	Spec. Limit min	Spec. Limit max	Notes
1	Is	mA		11	
2	Ibf	µA		2	
3	Vref	V	2.155	2.265	
4	Vline tolerance	%	-1.5	1.5	
5	Isrc	µA	100	225	
6	Gain	dB			No spec limit, typical is 65dB
7	Switch-on Voltage	V		1.85	
8	Switching Freq	kHz	90	110	
9	Duty Cycle	%	85		

TABLE IV: Summary of Electrical Measurements after Total Dose Exposures and Annealing for MAX724ECK (1)

					Total Dose Exposure (kRads Si)										Annealing	
					Initial		5		10		15		20		168 hours @25°C	
Test #	Parameters	Units	Spec. Lim. (2) min	Spec. Lim. (2) max	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd
1	Is	mA		11	4.3	0.2	5.1	0.4	4.7	0.1	4.6	0.1	3.8	0.1	3.9	0.2
2	Ibf	µA		2	0.2	0.01	0.2	0.01	0.2	0.01	0.3	0.02	0.3	0.02	0.3	0.02
3	Vref	V	2.155	2.265	2.204	0.008	2.203	0.008	2.203	0.008	2.203	0.008	2.203	0.008	2.203	0.008
4	Vline tolerance	%	-1.5	1.5	0.13	0.01	0.14	0.01	0.14	0.02	0.14	0.02	0.14	0.01	0.13	0.01
5	Isrc	µA	100	225	155	12	158	5	150	9	150	8	145	8	155	9
6	Gain	dB			66.4	1.1	65.8	0.7	64.9	1.3	64.9	1.9	64	0.7	64.6	1
7	Switch-on Voltage	V		1.85	0.44	0.14	0.39	0	0.74	0.14	0.79	0	0.79	0	0.49	0.19
8	Switching Freq	kHz	90	110	101	3	102	3	102	3	102	3	102	3	101.9	3
9	Duty Cycle	%	85		94.7	0.2	94	0.2	93.3	0.3	92.7	0.3	92.6	0.3	92.9	0.4

Notes:

(1) The mean and standard deviation values were calculated over the eight parts irradiated in this testing. The control samples remained constant throughout testing and ar

(2) No post radition specification limits were given at the time of testing. Parameters selected by the project and tested according to the needs of the flight configuration.

Radiation sensitive parameters: none